

NEUROANATOMY

for Speech Language Pathology and Audiology

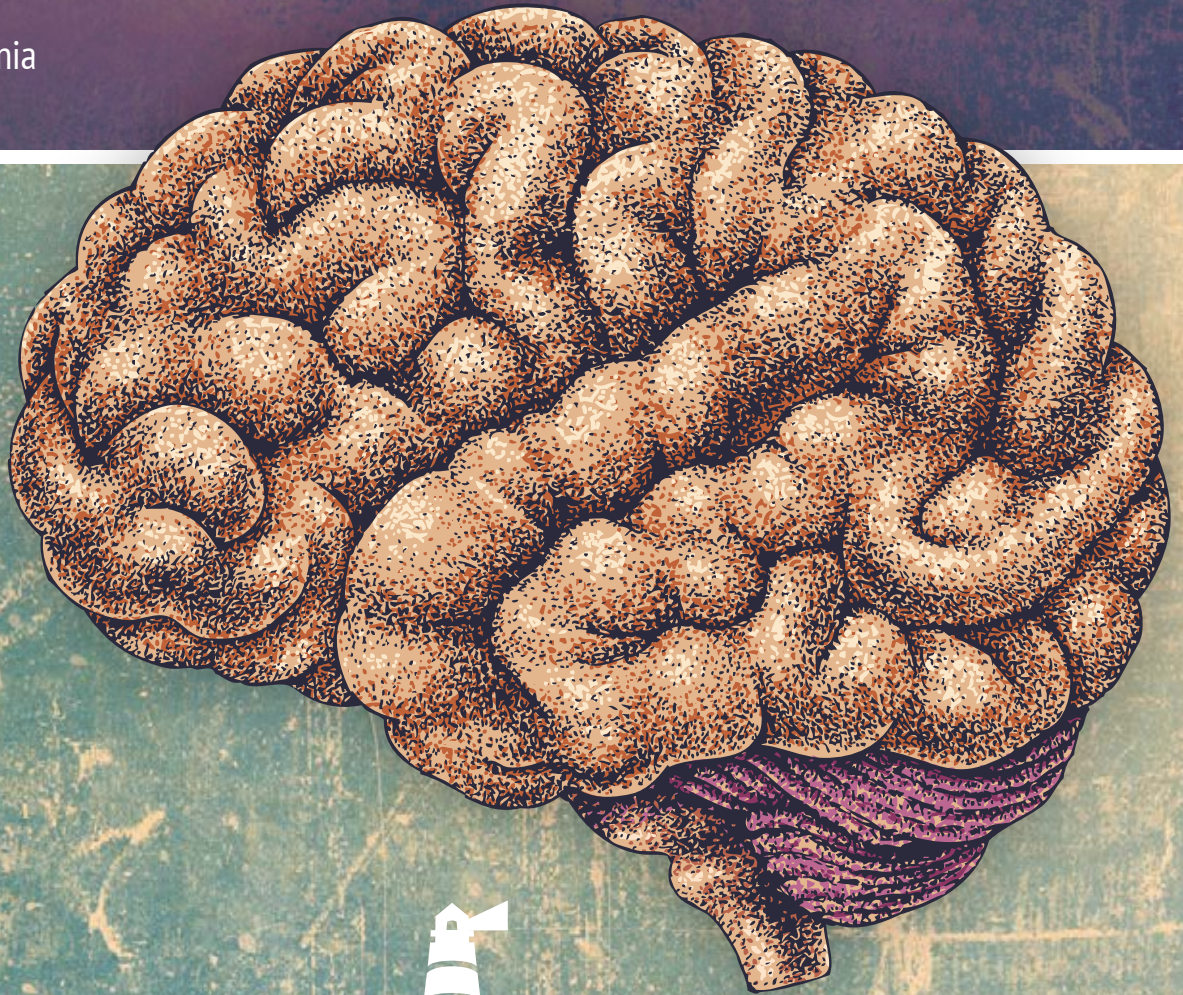
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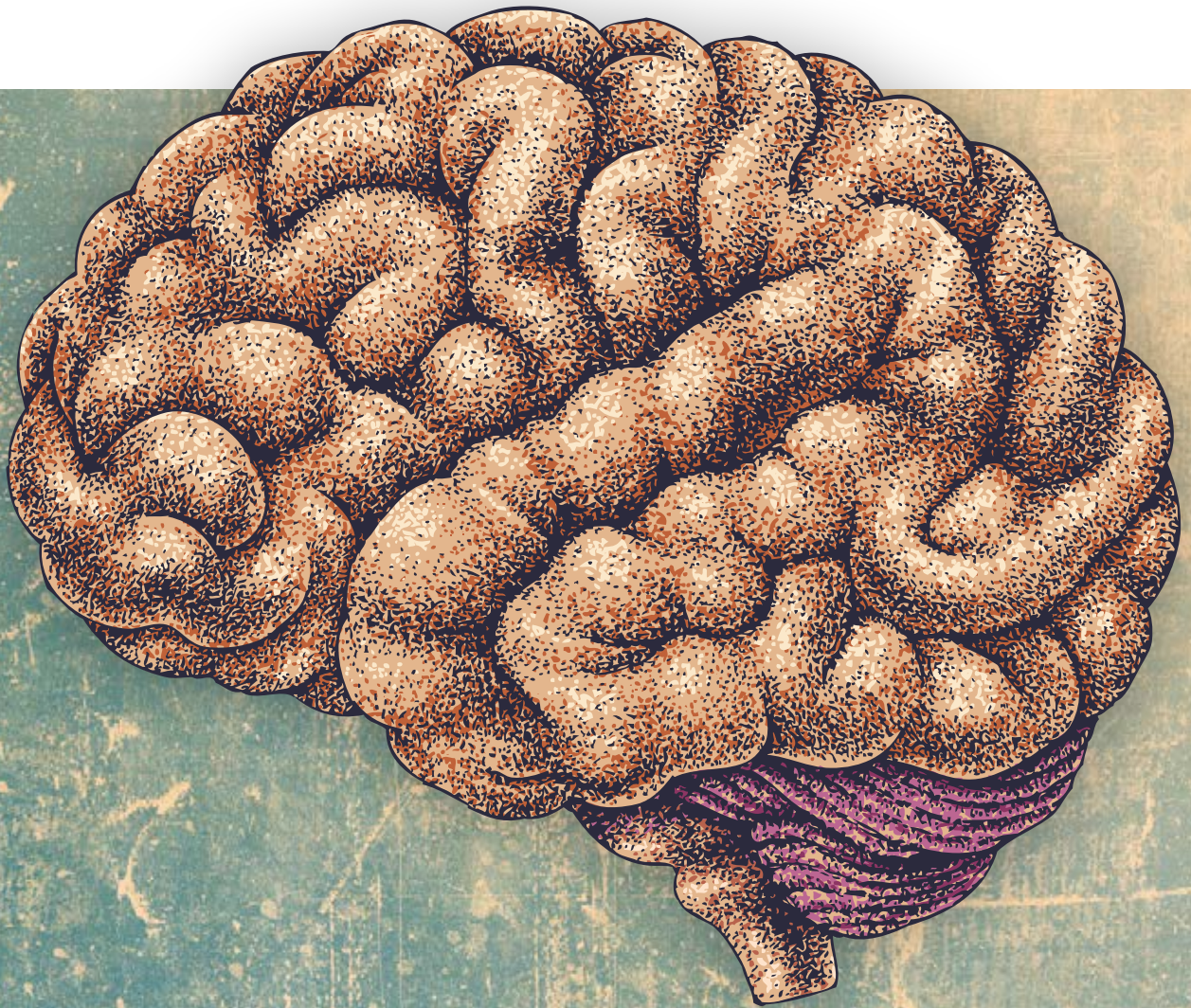
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THIS BOOK IS DEDICATED TO THREE SETS OF PEOPLE:

To my wife, Chrissie, and my daughters, Torie and Lexie . . . thank you for your gracious gift of time to complete this book.

To my parents . . . thank you for your years of love, commitment, and encouragement.

To my 2013 neuroanatomy class . . . thank you for being guinea pigs for early drafts of this book. Your feedback has made this text better.



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PREFACE

This text is primarily intended for graduate students studying communication sciences and disorders, but it is also written in an accessible way for junior or senior undergraduates preparing for graduate school. It is more important than ever for communication science and disorders students to understand the neurological underpinnings of communication disorders. I remember not having a neuroanatomy class in either my undergraduate or graduate training. At that time, this kind of information was imbedded over the span of a couple of weeks in an anatomy of speech course. After graduate school I entered the profession as a staff speech-language pathologist at a regional trauma center. It was here that I was challenged to learn about a variety of neurological disorders that I had previously learned little about. It has been nearly a quarter century since I completed my master's studies, and a lot has changed since that time. Now nearly all graduate training programs have a class in neuroscience to help students better understand, assess, and treat people with neurogenic communication disorders.

This text was born after a 15-year search for a neuroscience book focused on communication and communication disorders for my class. I adopted general neuroscience texts written by neurologists and neuroscientists, but I was unhappy about the lack of discussion about communication and communication disorders. I also tried texts written by communication scientists and others in communication disorders, but I found these to resemble the general neuroscience texts with some discussion of communication disorders sprinkled in here and there. Often, robust discussions of language or swallowing were entirely missing. I mentioned this frustrating search to a salesperson from Jones & Bartlett Learning, who asked "Have you ever thought about writing one?" The gauntlet was laid down and I realized that it was time to stop complaining and produce something that would at least help me in my class. My hope is that this text will be helpful to those of you who also teach this subject matter.

Organization of the Text

Neuroanatomy for Speech Language Pathology and Audiology is organized into three main sections. The first three chapters, comprising Part I, handle introductory issues. Chapter 1 introduces the reader to the world of neurology. Important

terms, like *neurology*, are explored, as well as neurological disorder classification and a brief introduction to the history of neuroscience. Chapter 2 discusses how a neurologist examines a person with a suspected neurological condition and looks at points of overlap with what a speech-language pathologist or audiologist would do in his or her assessment. A brief overview of imaging technology is included because these professionals are consumers of the reports generated by these studies. Chapter 3 introduces some basic orientation terms that will help in navigating around neurological structures. This chapter also surveys the development of the neurological system from conception through the first couple of years of life.

Part II includes Chapters 4 through 8 and examines the neurological system proper. In Chapter 4 we take a microscopic approach and discuss the cells of the nervous system, both their structure and function. Chapter 5 zooms out to begin a macroscopic journey around the neurological structures (i.e., structures we can see and examine with the naked eye). More specifically, it looks at the spinal cord, brainstem, and cerebellum. The journey continues north in Chapter 6 by examining structures in the middle of the brain, an area known as the diencephalon that includes the thalamic structures as well as structures in close proximity like the brain's ventricles. The focus again moves north in the next two chapters to the cerebral hemispheres. Chapter 7 discusses the overall structure of the cerebral hemispheres, such as their sulci, gyri, and blood supply. Chapter 8 then surveys important areas of the cerebral cortex using the Brodmann numbering system. Here we discuss the structure and function of various areas, such as Broca's and Wernicke's, two areas crucial in speech production and comprehension.

Part III includes Chapters 9 through 15; I believe these chapters are unique when compared to other neuroscience texts for speech-language pathologists and audiologists because they specifically focus on the neurology of speech, language, hearing, cognition, emotion, and swallowing. These are the communication processes important to these professionals. Chapter 9 begins this third section by exploring consciousness. We say that speech is a voluntary, conscious activity, but what do we mean by consciousness? What are the disorders of consciousness that might affect communication? Chapter 10 is of special interest to audiologists because

it explores the neurology of the hearing and balance systems and includes discussion of disorders of these systems. Chapter 11 turns to the topic of speech. It looks at neurological structures crucial for speech production and attempts to connect problems with these structures to various speech disorders observed in clinical practice. Language is the focus of Chapter 12. The neurological structures involved in speaking, listening, reading, and writing are explored as well as communication disorders associated with each of these modalities. Chapter 13 moves away from communication to swallowing. The cortical and subcortical controls of swallowing are surveyed as well as neurogenic swallowing problems. In recent years, speech-language pathologists have taken a more active role in what are called cognitive-communicative disorders. Chapter 14 focuses on cognition by looking at three main areas of cognition: attention, memory, and executive functions. The final chapter, Chapter 15, looks at the neurology of emotion. As the rate of autism increases and children with this condition become more prevalent on case-loads, there has been increased interest in how these children process and produce emotional responses. Chapter 15 discusses what we know about the neurology of emotion and the neurological differences between typical children and those with conditions like autism.

Features and Benefits

Each chapter includes a number of pedagogical features designed to enhance student learning. At the beginning of each chapter you will find a *Chapter Preview* that gives the reader a general introduction to the chapter's contents, an

In This Chapter feature that lists main points discussed in the chapter, a *Chapter Outline* that lists the main headings for quick reference, and *Learning Objectives* that present the chapter's desired outcomes.

At the end of each chapter, the information related to these learning outcomes is described in the *Summary of Learning Objectives* feature. *Key Terms* are also listed, the definitions for which can be found in the Glossary at the end of this text. Suggestions for drawing activities—critical for visual learners—are presented in the *Draw It to Know It* feature, and *Questions for Deeper Reflection* and *Suggested Projects* encourage students to delve deeper into the material. Finally, *References* are included to facilitate further study.

Instructor Resources

In addition to the listed features within the text, there are also supplemental learning materials available for teachers through Jones & Bartlett Learning. They include the following:

- Test Bank, containing more than 250 questions
- Instructor's Manual, including sample answers for the Questions for Deeper Reflection
- Slides in PowerPoint format, featuring more than 200 slides
- Image Bank, supplying key figures from the text
- Sample Syllabus, showing how a course can be structured around this text

Qualified instructors can gain access to these teaching materials by contacting their Health Professions Account Specialist at go.jblearning.com/findarep.

ABOUT THE AUTHOR



Matthew H. Rouse earned a B.S. in Biology from the University of Redlands in 1990 before he transitioned into the field of Communication Sciences and Disorders, earning an M.S. in Communication Disorders from the University of Redlands in 1992. After graduation, he worked in the hospital system as a speech-language pathologist from 1992 to 2000. In 1999, Matt accepted a full-time teaching position at Biola University in the Communication Disorders program and is currently the chair of the Department of Communication Sciences and Disorders. He earned his doctoral degree in Speech-Language Pathology in 2009 and wrote his dissertation on training students in empathetic counseling skills. His research interests include neuroscience, neurogenic communication disorders, and counseling. Matt lives in Whittier, California, with his wife and two children.

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